



**CONESTOGA-ROVERS  
& ASSOCIATES**

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December 8, 2010

US EPA RECORDS CENTER REGION 5



417639

Reference No. 056393

Mr. Michael Berkoff  
Remedial Project Manager  
U.S. Environmental Protection Agency - Region V  
Superfund Division, Remedial Response Section #2  
77 West Jackson Boulevard (SR - 6J)  
Chicago, Illinois 60604 - 3590

Dear Mr. Berkoff:

Re: Remedial Action Monthly Progress Report No. 9 - November 2010  
12<sup>th</sup> Street Landfill Operable Unit No. 4  
Allied Paper, Inc./Portage Creek/Kalamazoo River Superfund Site  
Allegan and Kalamazoo County

As required by Task 4, Progress Reports in the Statement of Work for the Remedial Design and Remedial Action at the 12<sup>th</sup> Street Landfill Operable Unit No. 4, please find attached the Progress Report No. 9 for the period of November 1, 2010 through November 30, 2010.

Should you have any questions or require any additional information, please do not hesitate to contact the undersigned.

Yours truly,

CONESTOGA-ROVERS & ASSOCIATES

Gregory A. Carli, P. E.

AS/cs/27

cc: J. Saric (U.S. EPA) - electronic only	R. Gay (Weyerhaeuser) - electronic only
L. Kirby-Miles (U.S. EPA) - electronic only	M. Lebo (Weyerhaeuser) - electronic only
S. Chummar (U.S. EPA) - electronic only	J. Jackowski (Weyerhaeuser) - electronic only
T. Prendiville (U.S. EPA) - electronic only	M. Erickson (Arcadis) - electronic only
S. Borries (U.S. EPA) - electronic only	D. Penniman (Arcadis) - electronic only
R. Frey (U.S. EPA) - electronic only	G. Griffith (Georgia-Pacific LLC) - electronic only
S. Hutsell (CH2MHILL) - electronic only	J. Keiser (CH2M Hill) - electronic only
P. Bucholtz (MDNRE) - three hard copies	J. Dembowske (CRA) - electronic only
K. Zakrzewski (MDNRE) - electronic only	A. Stadnyk (CRA) - electronic only



**Remedial Action Progress Report No. 9  
November 1, 2010 to November 30, 2010**

**Remedial Design and Remedial Action  
12th Street Landfill, Operable Unit No. 4  
Otsego, Michigan**

This progress report is being submitted to the United States Environmental Protection Agency (U.S. EPA) in accordance with Task 4: Progress Reports and the Summary of Major Deliverables/Schedule contained in the Statement of Work for the Remedial Design and Remedial Action pursuant to the terms of the Consent Decree for the Design and Implementation of Certain Response Action at Operable Unit No. 4 and the Plainwell, Inc. Mill Property (Site) of the Allied Paper, Inc./Portage Creek/Kalamazoo River Superfund Site (Consent Decree) which became effective February 22, 2005.

**1. WORK PERFORMED**

- On November 2, 2010, approximately six cubic yards of general fill material was removed from a wash-out area within the Kalamazoo River. The wash-out occurred in October 2010 as a result of inclement weather. A photographic log documenting the removal activities was submitted to the U.S. EPA and the Michigan Department of Natural Resources and Environment (MDNRE) on November 3, 2010.
- On November 8, 2010, the first drilling crew mobilized to the Site and began vertical aquifer sampling (VAS) at the approved groundwater monitoring well locations.
- On November 10, 2010, Progress Report No. 8 was submitted to the U.S. EPA. The October 2010 results for 14 liner destruct samples and the liner installation quality assurance/quality control (QA/QC) data were presented in the progress report.
- On November 10, 2010, CRA submitted to the U.S. EPA and MDNRE the proposed VAS monitoring well locations for MW-108 and MW-109. These monitoring wells are generally located along the northern and western MDNRE property boundaries. Three potential locations for monitoring wells MW-108 and MW-109 were identified and VAS was proposed at each location to determine the optimum location for two monitoring wells. In addition, CRA indicated that an additional well may be installed at a third location following review of the VAS analytical results.
- On November 10, 2010, the MDNRE approved the proposed VAS monitoring well locations and the proposed approach for determining the final monitoring well locations for MW-108 and MW-109.
- On November 11, 2010, an additional drilling crew mobilized to the Site and began VAS.
- On November 16, 2010, a Pre-Certification Inspection Meeting and Site walk-through were conducted. Outstanding construction items identified included: installation of a staff gauge,

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final dressing and topsoil placement, seeding and placement of erosion control matting, installation of a Site fence, increasing the height of gas vents, silt fence installation, demobilization of Site trailers, placement of Site property signs, and installation of groundwater monitoring wells. Meeting minutes summarizing the Pre-Certification Inspection are included as Attachment A.

- On November 17, 2010, the MDNRE provided a response regarding the removal of logs and brush at the northwestern corner and western side of the MDNRE property and indicated that the MDNRE would like the material removed. On November 18, 2010, CRA and MDNRE participated in a conference call to discuss the vegetative material in question and determined that a significant quantity of the material was pre-existing and that Weyerhaeuser would be responsible for the removal of only those materials added to the stockpile during the course of the construction activities. The U.S. EPA and the MDNRE were notified on November 22, 2010 that 95 percent of the wood/vegetation stockpile was present prior to the start of work, and that Weyerhaeuser would be responsible for and would remove two trees and related brush, but was not responsible for removing pre-existing materials. CRA subsequently removed the material in which Weyerhaeuser was responsible for and a small quantity of the pre-existing stockpile. Attachment B presents a photographic log that documents the final condition of the MDNRE property.
- On November 23, 2010, CRA submitted a figure showing the typical construction of the groundwater monitoring well wetland platforms to the U.S. EPA and MDNRE. The platforms were proposed to address potential issues caused by seasonal surface water in the vicinity of the wetland monitoring wells. In addition, the introduction of a soil platform at each wetland groundwater monitoring well location would allow access to complete the well installation/construction and provide access to complete future groundwater sampling. Attachment B presents a photographic log that documents the final construction of the wetland platforms.
- On November 23, 2010, the MDNRE requested additional information regarding the necessity and final design specifications for the platforms. The request specifically addressed the utilization of clean soil to construct the platforms and the reasoning for not considering an alternative material, such as a wooden platform.
- On November 23, 2010, VAS was completed at the Site.
- On November 24, 2010, CRA provided a response to the MDNRE regarding the final design of the groundwater monitoring well wetland platforms. The platforms were designed to be constructed of soil for the following reasons:

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Otsego, Michigan**

- Soil platforms would prevent surface water infiltration into shallow screened wells
  - Soil platforms would allow for shallow monitoring wells to be constructed and screened at depths approximately 6 inches below ground surface, providing additional support above the screened interval
  - Soil platforms offered a more diverse vegetation option, as both the elevated surface and side slopes would support wetland vegetation growth
  - Wooden platforms would not support wetland vegetation
  - Wooden platforms would not be able to support the drilling rig required to install each groundwater monitoring well
  - Wooden platforms would require potential long term maintenance
- The following field activities were conducted during the November 2010 reporting period:
    - Site security is present only on weekends. Security patrols are conducted from 5:00 pm on Friday to 7:00 am on Monday. As of Monday, November 29, 2010, Site security is no longer present because major construction activities have been completed at the Site.
    - Repaired erosion areas resulting from rain events in late October 2010 on the east side of Site adjacent to the MDNRE property boundary.
    - Installed geoweb material in swale area located near the outlet to the Kalamazoo River along the northern MDNRE property boundary and in swales located at the southwest corner and along the west side of the Site.
    - Excavated swale channels along the southwest, west, and southeast sides of the Site and removed general fill sediment from constructed swales and outlets along north side of the Site.
    - Extended liner flap and geocomposite material, placed general fill on geocomposite material, and installed bottom stone layer within geotextile for toe drain in the area of the former temporary access road near the southeast corner of the Site.
    - Installed upper stone layer within geotextile for toe drains along the eastern, southeastern, southwestern, western, northwestern, and northern portions of the Site.
    - Placed geotextile and stone layer for geonet discharge along the toe of slope adjacent to the western and northern MDNRE property boundaries.
    - Placed stone layer for geonet discharge along the toe of slope on the north, northwest, and west sides of the Site.

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- Placed geotextile and rip-rap at swale outlets to the Kalamazoo River and at swale outlets along the north and northwest sides of the Site.
- Delivered and placed topsoil along the west upper slope and upper slopes along the western and northern MDNRE property boundaries; on top portion of the landfill; in swale areas located along the northern MDNRE property boundary, at the southeast corner of Site, and along the northwestern and northern sides of the Site; on lower slopes below swales adjacent to the northern and western MDNRE property boundaries and on the western and northern sides of Site; and along the slope adjacent to the swale on the southeast side of the Site.
- Placed rip-rap check dams in swales along the northern and western MDNRE property boundaries and in swales along the western and northern sides of the Site.
- Installed Site security fence.
- Seeded Site and installed three types of erosion control matting from North American Green (S150 on 4H:1V slopes; DS150 from the top of the drainage swale to the wetland area on north side of the Site; and SC250 within the drainage swales on the north side of Site) and straw matting with tackifier on top portions of the landfill as discussed during the Pre-Certification Inspection Meeting.
- Installed turf reinforcement mat in swale areas and along the east side of the Site adjacent to the Kalamazoo River, as specified.
- Constructed three soil wetland platforms at monitoring well locations MW-103, MW-104, and MW-105.
- Installed gas probes GP-1 through GP-3.
- Installed chain-link fence and access gates, as specified at the south perimeter of the Site.

**2. DATA RECEIVED**

- No analytical data was received during the November 2010 reporting period.

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**3. MODIFICATIONS TO WORK PLANS OR OTHER SCHEDULES  
PROPOSED TO, OR APPROVED BY, THE U.S. EPA**

- A modification was made to the final erosion control measures, which included the placement of North American Green S150 erosion control matting on 4H:1V slopes as an alternative to straw matting and tackifier. This modification was discussed during the Pre-Certification Inspection Meeting. The modification was made to reduce the potential for erosion issues occurring in late fall/early spring while vegetation is being established. Attachment C presents a memorandum identifying the additional erosion control measures and includes a figure of the areas that received erosion control matting.
- A modification was made for groundwater monitoring wells located in wetland areas and included the construction of soil platforms. The platforms were proposed to address issues caused by seasonal surface water in the vicinity of the wetland monitoring wells. In addition, the introduction of a soil platform at each wetland groundwater monitoring well location allows access to complete the well installation/construction and provides access to complete future groundwater sampling. A figure depicting the typical construction of the groundwater monitoring well wetland platforms was submitted to the U.S. EPA and MDNRE on November 23, 2010.

**4. PROBLEMS ENCOUNTERED AND PLANNED RESOLUTION**

- CRA Services is on schedule with the revised master schedule submitted on September 8, 2010.

**5. WORK ANTICIPATED DURING THE NEXT REPORTING PERIOD**

- In accordance with the approved Remedial Action Work Plan (RAWP), the following field activities are scheduled to commence during the December 2010 reporting period:
  - Installation of groundwater monitoring wells based on the VAS analytical data
  - Excavation of additional material from the Wyoming Asphalt Plant property

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**6. ANTICIPATED DEVELOPMENT WITH WORK DURING THE NEXT PERIOD**

- With the Pre-Certification Inspection meeting completed, weekly conference calls and/or meetings between the U.S. EPA and the Project Technical Team are no longer required. A final inspection certification meeting will be scheduled for late spring or early summer 2011, as appropriate.

**7. OTHER RELEVANT INFORMATION**

- No other Site related information to report.

ATTACHMENT A

PRE-CERTIFICATION INSPECTION MEETING MINUTES



**PRE-CERTIFICATION  
INSPECTION  
MEETING MINUTES**

Reference No. 056393

PROJECT: 12<sup>th</sup> Street Landfill Operable Unit No. 4 - Remedial Action Implementation  
481 12th Street, Plainwell MI 49080 056393  
Allied Paper/Portage Creek/Kalamazoo River Superfund Site

LOCATION: Site Office DATE: November 16, 2010 TIME: 10:00 AM

Participants:

Michael Berkoff, U.S. EPA	Kristi Zakrzewski, MDNRE	John Bradley, (MDNRE) -via telephone	Jeff Keiser, CH2M Hill
Scott Hutsell, CH2M Hill	Grant Koster, CH2M Hill	Richard Gay, Weyerhaeuser	Greg Carli, CRA
Renee Pionk, CRA	Pete Lewis, CRA Services	Rick Hoekstra, CRA	Jodie Dembowski, CRA Services
Aaron Stadnyk, CRA			

Distribution:

To all participants listed above.	Hassan Gilani, Inspec-Sol		
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<i>Item</i>	<i>Description</i>	<i>Action By</i>
<b>1</b>	<b><u>MEETING AGENDA</u></b>	
1 a.	Groundwater Monitoring Well Locations/Construction Details	All Staff
1 b.	Progress of Work	
1 c.	Outstanding Construction Items	
1 d.	Progress Schedule for Remaining Work	
1 e.	Project Issues	
1 f.	Action Items	
1 g.	Administrative Issues	
<b>2</b>	<b><u>WETLAND GROUNDWATER MONITORING WELL LOCATIONS/CONSTRUCTION DETAILS</u></b>	
2 a.	John Bradley from the Michigan Department of Natural Resources and the Environmental (MDNRE) participated during the first portion of the meeting via conference call. Mr. Bradley identified two concerns as follows: i. The originally proposed locations of monitoring wells MW-108 and MW-109	



Item	Description	Action By
	<p>ii. The construction specifications and screen intervals of monitoring wells MW-103 through MW-105, located within the on-Property wetlands</p> <p>CRA addressed John Bradley's concerns as follows:</p> <p>i. CRA proposed to relocate MW-108 and MW-109, based on comments received from John Bradley. CRA stated that Vertical Aquifer Sampling (VAS) would be conducted at the new locations of MW-108 and MW-109, as well as third location MW-110. Based on the VAS sample results, monitoring wells would be installed at MW-108 and MW-110, and potentially an additional monitoring well at MW-109.</p> <p>ii. CRA proposed to design/construct a soil platform at each proposed wetland groundwater monitoring well location to address surface water infiltration issues and provide accessibility for installation and monitoring activities.</p>	CRA
<b>3</b>	<b><u>PROGRESS OF WORK</u></b>	
3 a.	Extended liner flap and geocomposite material, placed general fill on geocomposite material, and installed bottom stone layer within geotextile for toe drain in the area of the former temporary access road near the southeast corner of the Site.	
3 b.	Installed upper stone layer within geotextile for toe drains along the eastern, southeastern, southwestern, western, northwestern, and northern portions of the Site.	
3 c.	Placed geotextile and stone layer for geonet discharge along the toe of the slope adjacent to the western and northern MDNRE property boundaries.	
3 d.	Placed stone layer for geonet discharge along the toe of the slope on the north, northwest, and west sides of Site.	
3 e.	Placed geotextile and rip-rap at swale outlets to the Kalamazoo River and at swale outlets along the north and northwest sides of the Site.	
3 f.	Delivered and placed topsoil along the west upper slope and upper slopes along the western and northern MDNRE property boundaries, on the top portion of landfill, in swale areas located along the northern MDNRE property boundaries, at the southeast corner of the Site, and along the northwestern and northern sides of the Site, on lower slopes below swales adjacent to the northern and western MDNRE property boundaries and on the western and northern sides of the Site, and along the slope adjacent to the swale on the southeast side of the Site.	
3 g.	Placed rip-rap check dams in swales along the northern and western MDNRE property boundaries and in swales along the western and northern sides of the Site.	
<b>4</b>	<b><u>OUTSTANDING CONSTRUCTION ITEMS</u></b>	
4 a.	Complete final dressing of Site with topsoil.	



<i>Item</i>	<i>Description</i>	<i>Action By</i>
4 b.	Installation of a staff gauge within the Kalamazoo River. The installation of a staff gauge was discussed and determined to be postponed until spring 2011. In the meantime, CRA will take readings from the staff gauge currently installed within the Kalamazoo river at the southeast corner of the Site.	
4 c.	Increase the stack height of each landfill gas vent by two feet, per the design specifications.	
4 d.	Complete seeding of the entire landfill surface, followed by the installation of erosion control matting along the 4H: 1V side slopes, drainage swales and the drainage ditch.	
4 e.	Installation of a perimeter Site fence, including controlled access gates at the south and southeast entrances to the Site.	
4 f.	Installation of silt fence as specified in the Final Design. CRA and MDNRE discussed the requirement of the silt fence along the east boundary of the Site, adjacent to the Kalamazoo River. It was determined that the silt fence would not be required for this portion of the Site.	
4 g.	General housekeeping and Site clean-up prior to demobilization activities.	
4 h.	Demobilization of U.S. EPA/CH2MHill Site trailer.	
4 i.	Relocate CRA Engineering trailer to the Wyoming Asphalt Plant Property.	
4 j.	Design permanent Site markers for review by U.S. EPA and MDNRE, prior to installation of Site signs.	
4 k.	Installation of groundwater monitoring wells.	
<b>5</b>	<b><u>PROJECT SCHEDULE FOR REMAINING WORK</u></b>	
5 a.	CRA is completing the final dressing and topsoil placement, seeding and placement of erosion control blanket, installation of a Site fence, increasing the height of the gas vents, and silt fence installation during the week of November 22, 2010.	
5 b.	Demobilization of Site trailers is to be completed during the week of November 29, 2010.	
5 c.	Additional excavation activities at the Wyoming Asphalt Plant will be completed from December 6, 2010 through December 22, 2010.	
5 d.	Placement of Site property signs and the installation of groundwater monitoring wells will be completed during the week of December 22, 2010.	
<b>6</b>	<b><u>PROJECT ISSUES</u></b>	
6 a.	<b><u>U.S. EPA:</u></b> Michael Berkoff to contact U.S. EPA Wetlands department to determine if the construction of the soil platforms is acceptable in terms of importing fill in to a wetland area.	
6 b.	<b><u>MDNR:</u></b> Kristi Zakrzewski to contact State Wetlands Department to determine if the construction of the soil platforms is acceptable in terms of importing fill material into a wetland area.	



**CONESTOGA-ROVERS  
& ASSOCIATES**

<i>Item</i>	<i>Description</i>	<i>Action By</i>
6 c.	<u>CRA:</u> None.	
6 d.	CRA Services: None.	
7	<u>ACTION ITEMS</u>	
7 a.	CRA to submit proposed design of a typical soil platform for the wetland groundwater monitoring well locations.	
8	<u>ADMINISTRATIVE ISSUES</u>	
8 a.	Weekly meetings/conference calls have been cancelled based on the overall construction progress. A meeting will be planned once the VAS analytical results are available.	

Attachments: None

Prepared By: Aaron Stadnyk - CRA Date Issued: December 10, 2010

This confirms and records CRA's interpretation of the discussions which occurred and our understanding reached during this meeting. Unless notified in writing within 3 days of the date issued, we will assume that the following interpretation or description is complete and accurate.

ATTACHMENT B

PHOTOGRAPHIC LOG (DATE: NOVEMBER 30, 2010)



Photo 1: View of MDNRE property, facing northwest



Photo 2: View of landfill and MDNRE property, facing north





Photo 3: View of turf reinforcement mat installed along east side of Site adjacent to Kalamazoo River, facing north



Photo 4: View of erosion control matting along the northern MDNRE property boundary, facing west





Photo 5: View of erosion control matting on side slopes along east side of Site, facing northwest



Photo 6: View of erosion control matting along east side of Site adjacent to MDNRE western property boundary, facing south





Photo 7: View of piping extension made to gas vent, facing north



Photo 8: View of soil platform for groundwater monitoring well MW-105, facing northeast





Photo 9: View of soil platform for groundwater monitoring well MW-104, facing northwest



Photo 10: View of soil platform for groundwater monitoring well MW-103, facing west-southwest





Photo 11: View of straw matting and Site gate, facing south



Photo 12: View of gas probe GP-1, facing southeast





Photo 13: View of Site security fence, facing west



Photo 14: View of erosion control matting on west slope of landfill, facing north





Photo 15: View of erosion control matting on steep slope at southwest corner of landfill, facing east



ATTACHMENT C

DESIGN MODIFICATION TO THE FINAL EROSION CONTROL MEASURES



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## MEMORANDUM

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TO: Michael Berkoff - U.S. EPA REF. NO.: 056393-07

FROM: Aaron Stadnyk - CRA/cs/9 DATE: November 22, 2010

CC: 12<sup>th</sup> Street Landfill Technical Group

RE: **Notification of Design Modification - Final Erosion Control Measures  
12<sup>th</sup> Street Landfill Operable Unit No.4  
Allied Paper, Inc./Portage Creek/Kalamazoo River Superfund Site  
Allegan and Kalamazoo County**

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The following memorandum was prepared to document a design modification that was completed at the 12<sup>th</sup> Street Landfill Site, Operable Unit No. 4 of the Allied Paper, Inc./Portage Creek/Kalamazoo River Superfund Site, located in Plainwell, Michigan (Site). The design modification include the addition of erosion control blankets to the final erosion control measures implemented at the Site as part of the final design for the selected Remedial Action.

Based on the inclement weather conditions throughout the month of October 2010, which caused considerable erosion damage to the Site, the Michigan Department of Natural Resources and the Environment (MDNRE) identified a concern for potential future erosion damage at the Site, due to similar inclement weather conditions likely to occur during late fall 2010 and early spring 2011. In addition, the MDNRE identified concerns regarding the scheduling for the seeding activities at the Site, which were postponed until the erosion damage could be corrected. Subsequently, the MDNRE suggested a modification to the final erosion control measures to address potential erosion issues springing the fall of 2010/early spring of 2011. The modification will provide additional protection following seeding activities to ensure vegetation establishes at the Site, which may take longer than originally planned due to the cooler climate.

Based on the suggestions from MDNRE, it was determined that the installation of erosion control blankets at the Site would give added protection to the landfill side slopes while the seed takes. In addition, the introduction of erosion control blanket would be an added proactive measure to ensure that potential future erosion issues caused by the spring thaw are limited, which could minimize spring maintenance activities.

The following North American Green erosion control blanket was installed to the 4H:1V side slopes, as identified in the attached figure (see attached Drawing C-07 - Final Contour Plan). In addition, erosion control blankets were installed along the top of the drainage swales at the north perimeter of the Site, adjacent to the on-Property wetlands, and within the drainage ditches. The remainder of the Site was stabilized with straw matting and tackifier, as specified in the final design. A summary of the erosion control structures is presented below.

- 
- North America Green S-150 blanket was installed on the identified 4H:1V side slopes
  - North American Green DS-150 blanket was installed from the top of the drainage swale to the wetland area on the north side of the Site
  - North American Green SC-150 was installed within the drainage swales on the north side of the Site

Specification data sheets for each type of erosion control blanket installed at the Site are attached and will be submitted as part of the final construction completion report.



NO	Revision	Date	Initial

**LEGEND**

- APPROXIMATE PROPERTY BOUNDARY
- EXISTING PAVED ROAD
- EXISTING UNPAVED ROAD
- EXISTING FENCE
- EXISTING BUILDING
- EXISTING GROUND ELEVATION CONTOUR
- EXISTING TREES AND/OR BRUSH
- EXISTING WET AREA AND WETLAND
- EXISTING EDGE OF WATER
- EXISTING LIMITS OF PAPER RESIDUALS
- P2-1 EXISTING MONITORING WELL LOCATION (TO BE ABANDONED)
- P2-2 EXISTING PIEZOMETER LOCATION (TO BE ABANDONED)
- (11-15) EXISTING LEACHATE HEAD WELL LOCATION (TO BE ABANDONED)
- S5-1 EXISTING STAFF GAUGE (TO BE ABANDONED)
- S5-2 EXISTING INSPEC-SOL SOIL BORING LOCATION
- EXISTING VANE SHEAR TEST LOCATION
- 718 PROPOSED FINAL ELEVATION CONTOURS
- PROPOSED ROAD/DRAINAGE SWALE
- c/w TURF REINFORCEMENT MAT
- PROPOSED ROAD/DRAINAGE SWALE STABILIZED WITH GEOWEB
- PROPOSED GAS VENT
- MW-106B PROPOSED MONITORING WELL
- PROPOSED EROSION CONTROL BLANKET

**NOTE:**

- ALL PROPOSED CONTOURS AND INVERT ELEVATIONS ARE TO BE CONFIRMED IN THE FIELD, PRIOR TO CONSTRUCTION, AND VERIFIED THAT THEY CONFORM WITH THE INTENT OF THE DESIGN.

**SCALE VERIFICATION**

THIS BAR MEASURES 1" ON ORIGINAL. ADJUST SCALE ACCORDINGLY.

Approved

**DRAWING STATUS**

ISSUED FOR CONSTRUCTION	APR. 7, 2010	CRH
ISSUED FOR EPA SUBMISSION (FINAL)	MAR. 12, 2010	CRH
Status	Date	Initial

**12th STREET LANDFILL**  
**Otsego Township, Michigan**

**FINAL DESIGN REPORT**

**FINAL**  
**CONTOUR PLAN**



Source Reference: BASE ADAPTED FROM PREVIOUS RMT DESIGN

Project Manager: G. CARLI	Reviewed By: R. HOEKSTRA	Date: MARCH 2010
Scale: 1" = 50'-0"	Project No: 56393-05	Report No: 005
		Drawing No: C-07



# Material and Performance Specification Sheet

North American Green  
 14649 Highway 41 North  
 Evansville, IN 47725  
 800-772-2040  
 FAX: 812-867-0247  
[www.nagreen.com](http://www.nagreen.com)

A **tensar** Company

## S150 Erosion Control Blanket

The short-term double net erosion control blanket shall be a machine-produced mat of 100% agricultural straw with a functional longevity of up to 12 months. (NOTE: functional longevity may vary depending upon climatic conditions, soil, geographical location, and elevation). The blanket shall be of consistent thickness with the straw evenly distributed over the entire area of the mat. The blanket shall be covered on the top and bottom sides with a lightweight photodegradable polypropylene netting having an approximate 0.50 x 0.50 (1.27 x 1.27 cm) mesh. The blanket shall be sewn together on 1.50 inch (3.81 cm) centers with degradable thread.

The S150 shall meet requirements established by the Erosion Control Technology Council (ECTC) Specification and the US Department of Transportation, Federal Highway Administration's (FHWA) *Standard Specifications for Construction of Roads and Bridges on Federal Highway Projects, FP-03 Section 713.17 as a type 2.D Short-term Double Net Erosion Control Blanket.*

The blanket shall be manufactured with a colored thread stitched along both outer edges (approximately 2-5 inches [5-12.5 cm] from the edge) as an overlap guide for adjacent mats.

Material Content		
<b>Matrix</b>	100% Straw Fiber	0.5 lbs/yd <sup>2</sup> (0.27 kg/m <sup>2</sup> )
<b>Nettings</b>	Top and Bottom nets, lightweight photodegradable	1.5 lb/1000 ft <sup>2</sup> ( 0.73 kg/100 m <sup>2</sup> ) approx. weight
<b>Thread</b>	Degradable	

S150 is available in the following standard roll sizes:

<b>Width</b>	4.0 ft (1.2 m)	6.67 ft (2.03 m)	16 ft (4.87 m)
<b>Length</b>	135 ft (41.14 m)	108 ft (32.92 m)	108 ft (32.92 m)
<b>Weight ± 10%</b>	30 lbs (13.6 kg)	40 lbs (18.14 kg)	96 lbs (43.54 kg)
<b>Area</b>	60 yd <sup>2</sup> (50.16 m <sup>2</sup> )	80.0 yd <sup>2</sup> (66.9 m <sup>2</sup> )	192 yd <sup>2</sup> (165.5 m <sup>2</sup> )

Index Value Properties:

Property	Test Method	Typical
Thickness	ASTM D6525	0.36 in (9.14 mm)
Resiliency	ECTC Guidelines	80.5%
Water Absorbency	ASTM D1117	514%
Mass/Unit Area	ASTM 6475	10.52 oz/yd <sup>2</sup> (357.7 g/m <sup>2</sup> )
Swell	ECTC Guidelines	15%
Smolder Resistance	ECTC Guidelines	Yes
Stiffness	ASTM D1388	6.06 oz-in
Light Penetration	ECTC Guidelines	9.8%
Tensile Strength - MD	ASTM D6818	169.2 lbs/ft (2.51 kN/m)
Elongation - MD	ASTM D6818	17.2%
Tensile Strength - TD	ASTM D6818	164.4 lbs/ft (2.44 kN/m)
Elongation - TD	ASTM D6818	33.1%

Performance Design Values:

Maximum Permissible Shear Stress	
Unvegetated Shear Stress	1.75 lbs/ft <sup>2</sup> (84 Pa)
Unvegetated Velocity	6.00 ft/s (1.83 m/s)

Slope Design Data: C Factors			
	Slope Gradients (S)		
Slope Length (L)	≤ 3:1	3:1 - 2:1	≥ 2:1
≤ 20 ft (6 m)	0.004	0.106	NA
20-50 ft	0.062	0.118	NA
≥ 50 ft (15.2 m)	0.12	0.180	NA

Bench Scale Testing\* (NTPEP):

Test Method	Parameters	Results
ECTC Method 2 Rainfall	50 mm (2 in)/hr for 30 min	SLR** = 8.04
	100mm (4 in)/hr for 30 min	SLR** = 10.46
	150 mm (6 in)/hr for 30 min	SLR** = 13.67
ECTC Method 3 Shear Resistance	Shear at 0.50 inch soil loss	2.1 lbs/ft <sup>2</sup>
ECTC Method 4 Germination	Top Soil, Fescue, 21 day incubation	484% improvement of biomass

\* Bench Scale tests should not be used for design purposes

\*\* Soil Loss Ratio = Soil loss with Bare Soil/Soil Loss with RECP (soil loss is based on regression analysis)

Roughness Coefficients- Unveg.	
Flow Depth	Manning's n
≤ 0.50 ft (0.15 m)	0.055
0.50 - 2.0 ft	0.055 - 0.021
≥ 2.0 ft (0.60 m)	0.021

Updated 3/09

Product Participant of:





# Material and Performance Specification Sheet

North American Green  
 14649 Highway 41 North  
 Evansville, IN 47725  
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A **tensar** Company

## DS150 Erosion Control Blanket

The ultra short-term double net erosion control blanket shall be a machine-produced mat of 100% agricultural straw with a functional longevity of up to 2 months. (NOTE: functional longevity may vary depending upon climatic conditions, soil, geographical location, and elevation). The blanket shall be of consistent thickness with the straw evenly distributed over the entire area of the mat. The blanket shall be covered on the top and bottom sides with a polypropylene netting having an approximate 0.50 x 0.50 (1.27 x 1.27 cm) mesh with photodegradable accelerators to provide breakdown of the netting within approximately 60 days, depending upon geographical location and elevation. The blanket shall be sewn together on 1.50 inch (3.81 cm) centers with degradable thread.

The DS150 shall meet requirements established by the Erosion Control Technology Council (ECTC) Specification and the US Department of Transportation, Federal Highway Administration's (FHWA) *Standard Specifications for Construction of Roads and Bridges on Federal Highway Projects, FP-03 Section 713.17 as a Type 1.D Ultra Short-term Double Net Erosion Control Blanket.*

The blanket shall be manufactured with a colored thread stitched along both outer edges (approximately 2-5 inches [5-12.5 cm] from the edge) as an overlap guide for adjacent mats.

Material Content		
<b>Matrix</b>	100% Straw Fiber	0.5 lbs/yd <sup>2</sup> (0.27 kg/m <sup>2</sup> )
<b>Nettings</b>	Top and Bottom nets, lightweight photodegradable with photo accelerators	1.5 lb/1000 ft <sup>2</sup> ( 0.73 kg/100 m <sup>2</sup> ) approx. weight
<b>Thread</b>	Degradable	

DS150 is available in the following standard roll sizes:

<b>Width</b>	4.0 ft (1.2 m)	6.67 ft (2.03 m)	16 ft (4.87 m)
<b>Length</b>	135 ft (41.14 m)	108 ft (32.92 m)	108 ft (32.92 m)
<b>Weight ± 10%</b>	30 lbs (13.6 kg)	40 lbs (18.14 kg)	96 lbs (43.54 kg)
<b>Area</b>	60 yd <sup>2</sup> (50.16 m <sup>2</sup> )	80.0 yd <sup>2</sup> (66.9 m <sup>2</sup> )	192 yd <sup>2</sup> (165.5 m <sup>2</sup> )

### Index Value Properties:

Property	Test Method	Typical
Thickness	ASTM D6525	0.34 in (8.59 mm)
Resiliency	ECTC Guidelines	80.5%
Water Absorbency	ASTM D1117	290%
Mass/Unit Area	ASTM 6475	7.59 oz/yd <sup>2</sup> (257 g/m <sup>2</sup> )
Swell	ECTC Guidelines	15%
Smolder Resistance	ECTC Guidelines	Yes
Stiffness	ASTM D1388	6.06 oz-in
Light Penetration	ECTC Guidelines	8.8%
Tensile Strength –MD	ASTM D6818	112.8 lbs/ft (1.67 kN/m)
Elongation – MD	ASTM D6818	22.5%
Tensile Strength – TD	ASTM D6818	117.6 lbs/ft (1.74 kN/m)
Elongation – TD	ASTM D6818	22.7%

### Performance Design Values:

Maximum Permissible Shear Stress	
Unvegetated Shear Stress	1.75 lbs/ft <sup>2</sup> (84 Pa)
Unvegetated Velocity	6.00 ft/s (1.83 m/s)

Slope Design Data: C Factors			
	Slope Gradients (S)		
	≤ 3:1	3:1 – 2:1	≥ 2:1
Slope Length (L)			
≤ 20 ft (6 m)	0.004	0.106	NA
20-50 ft	0.062	0.118	NA
≥ 50 ft (15.2 m)	0.12	0.180	NA

### Bench Scale Testing\* (NTPEP):

Test Method	Parameters	Results
ECTC Method 2 Rainfall	50 mm (2 in)/hr for 30 min	SLR** = 3.76
	100mm (4 in)/hr for 30 min	SLR** = 4.61
	150 mm (6 in)/hr for 30 min	SLR** = 5.65
ECTC Method 3 Shear Resistance	<b>Shear at 0.50 inch soil loss</b>	<b>2.06 lbs/ft<sup>2</sup></b>
ECTC Method 4 Germination	Top Soil, Fescue, 21 day incubation	424% improvement of biomass

\* Bench Scale tests should not be used for design purposes

\*\* Soil Loss Ratio = Soil loss with Bare Soil/Soil Loss with RECP (soil loss is based on regression analysis)

Roughness Coefficients- Unveg.	
Flow Depth	Manning's n
≤ 0.50 ft (0.15 m)	0.055
0.50 – 2.0 ft	0.055 – 0.021
≥ 2.0 ft (0.60 m)	0.021

Updated 3/09

Product Participant of:





# Material and Performance Specification Sheet

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## SC250 Turf Reinforcement Mat

The composite turf reinforcement mat (C-TRM) shall be a machine-produced mat of 70% straw and 30% coconut fiber matrix incorporated into a permanent three-dimensional turf reinforcement matting. The matrix shall be evenly distributed across the entire width of the matting and stitch bonded between a heavy duty UV stabilized netting with 0.50 x 0.50 inch (1.27 x 1.27 cm) openings, an ultra heavy UV stabilized, dramatically corrugated (crimped) intermediate netting with 0.5 x 0.5 inch (1.27 x 1.27 cm) openings, and covered by an heavy duty UV stabilized nettings with 0.50 x 0.50 inch (1.27 x 1.27 cm) openings. The middle corrugated netting shall form prominent closely spaced ridges across the entire width of the mat. The three nettings shall be stitched together on 1.50 inch (3.81cm) centers with UV stabilized polypropylene thread to form a permanent three-dimensional turf reinforcement matting.

The SC250 shall meet requirements established by the Erosion Control Technology Council (ECTC) Specification and the US Department of Transportation, Federal Highway Administration's (FHWA) *Standard Specifications for Construction of Roads and Bridges on Federal Highway Projects, FP-03 Section 713.18 as a type 5A, B, and C Permanent Turf Reinforcement Mat.*

Installation staple patterns shall be clearly marked on the turf reinforcement matting with environmentally safe paint. All mats shall be manufactured with a colored thread stitched along both outer edges (approximately 2-5 inches [5-12.5 cm] from the edge) as an overlap guide for adjacent mats.

Material Content		
<b>Matrix</b>	70% Straw / 30% Coconut fibers	0.35 lbs/yd <sup>2</sup> (0.19 kg/m <sup>2</sup> ) / 0.15 lbs/yd <sup>2</sup> (0.08 kg/m <sup>2</sup> )
<b>Nettings</b>	Top and Bottom, UV stabilized Polypropylene	5 lb/1000 ft <sup>2</sup> (2.44 kg/100 m <sup>2</sup> )
	Middle, corrugated UV stabilized Polypropylene	24 lb/1000 ft <sup>2</sup> (11.7 kg/100 m <sup>2</sup> )
<b>Thread</b>	Polypropylene, UV stabilized	

SC250 is available in the following roll sizes:

<b>Width</b>	6.5 ft (2.0 m)
<b>Length</b>	55.5 ft (16.9 m)
<b>Weight ± 10%</b>	34 lbs (15.42 kg)
<b>Area</b>	40.0 yd <sup>2</sup> (33.4 m <sup>2</sup> )

Index Value Properties:

Property	Test Method	Typical	Net Only
Thickness	ASTM D6525	0.72 in (18.3 mm)	0.48 in
Resiliency	ASTM 6524	95.2%	---
Density	ASTM D792	0.53 oz/in <sup>3</sup>	---
Mass/Unit Area	ASTM 6566	17.88 oz/yd <sup>2</sup> (606 g/m <sup>2</sup> )	---
Porosity	ECTC Guidelines	99%	---
Stiffness	ASTM D1388	222.65 oz-in	---
Light Penetration	ECTC Guidelines	8.9%	---
UV Stability	ASTM D4355/ 1000 hr	100%	100%
Tensile Strength MD	ASTM D6818	620 lbs/ft (9.05 kN/m)	655 lbs/ft
Elongation MD	ASTM D6818	35%	25%
Tensile Strength TD	ASTM D6818	737 lbs/ft (10.75 kN/m)	666 lbs/ft
Elongation TD	ASTM D6818	16%	16%

Bench Scale Testing\* (NTPEP):

Test Method	Parameters	Results
ECTC Method 2 Rainfall	50 mm (2 in)/hr for 30 min	SLR** = 18.25
	100mm (4 in)/hr for 30 min	SLR** = 20.97
	150 mm (6 in)/hr for 30 min	SLR** = 22.74
ECTC Method 3 Shear Resistance	Shear at 0.50 inch soil loss	7.7 lbs/ft <sup>2</sup>
ECTC Method 4 Germination	Top Soil, Fescue, 21 day incubation	523% improvement of biomass

\* Bench Scale tests should not be used for design purposes

\*\* Soil Loss Ratio = Soil loss with Bare Soil/Soil Loss with RECP (soil loss is based on regression analysis)

Updated 3/09

Performance Design Values:

Maximum Permissible Shear Stress		
	Short Duration	Long Duration
Phase 1 Unvegetated	3.0 lbs/ft <sup>2</sup> (144 Pa)	2.5 lbs/ft <sup>2</sup> (120 Pa)
Phase 2 Partially Veg.	8.0 lbs/ft <sup>2</sup> (383 Pa)	8.0 lbs/ft <sup>2</sup> (383 Pa)
Phase 3 Fully Veg.	10.0 lbs/ft <sup>2</sup> (480 Pa)	8.0 lbs/ft <sup>2</sup> (383 Pa)
Velocity Unveg	9.5 ft/s (2.9 m/s)	
Velocity Veg.	15 ft/s (4.6 m/s)	

Slope Design Data: C Factors			
	Slope Gradients (S)		
Slope Length (L)	≤ 3:1	3:1 – 2:1	≥ 2:1
≤ 20 ft (6 m)	0.0010	0.0209	0.0507
20-50 ft	0.0081	0.0266	0.0574
≥ 50 ft (15.2 m)	0.0455	0.0555	0.081

Roughness Coefficients- Unveg.	
Flow Depth	Manning's n
≤ 0.50 ft (0.15 m)	0.040
0.50 – 2.0 ft	0.040 – 0.012
≥ 2.0 ft (0.60 m)	0.011

Product Participant of:

